INFLUENCE OF FERMENTATION PARAMETERS ON FLOC SIZE DURING START-UP OF AN AIR-LIFT BIOREACTOR

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Flocculation Bioreactors present several advantages as compared to other high cell density techniques, when regarding design simplicity and energetic costs. There is however the inconvenience of low reaction rates due to cell aggregation.

Ethanolic fermentations using a highly flocculent yeast strain were conducted in an air-lift operating continuously for different dilution rates (up to 0.2 /hr) and aeration rates (up to 0.1 v.v.m.). During start-up samples were periodically taken from inside the reactor and from the effluent. The samples were analysed with respect to glucose, ethanol and biomass concentrations and also floc size distribution. Assuming CSTR dynamics kinetic parameters were calculated.

It is shown that, as fermentation start-up proceeds, the mean floc size increases. Such an evolution in floc size is highly dependent on the aeration rate and, to a lesser extent, on the dilution rate.

The results suggest that glucose and oxygen diffusional limitations inside flocs are a critical factor in the fermentation process. The increase in the aeration rate, by maintaining higher liquid shear stress, reducing floc size and allowing for higher oxygen transfer rates, may reduce these limitations.